EGU2020-21947
https://doi.org/10.5194/egusphere-egu2020-21947
EGU General Assembly 2020

Estimation of fine-scale relative humidity profiles: an issue for understanding the atmospheric water cycle

Veronique Michot, Helene Brogniez, Mathieu Vrac, Soulivanh Thao, Helene Chepfer, Pascal Yiou, and Christophe Dufour
PARIS-SACLAY, LATMOS-IPSL, France (veronique.michot@latmos.ipsl.fr)

The multi-scale interactions at the origin of the links between clouds and water vapour are essential for the Earth's energy balance and thus the climate, from local to global. Knowledge of the distribution and variability of water vapour in the troposphere is indeed a major issue for the understanding of the atmospheric water cycle. At present, these interactions are poorly known at regional and local scales, i.e. within 100km, and are therefore poorly represented in numerical climate models. This is why we have sought to predict cloud scale relative humidity profiles in the intertropical zone, using a non-parametric statistical downscaling method called quantile regression forest. The procedure includes co-located data from 3 satellites: CALIPSO lidar and CloudSat radar, used as predictors and providing cloud properties at 90m and 1.4km horizontal resolution respectively; SAPHIR data used as a predictor and providing relative humidity at an initial horizontal resolution of 10km. Quantile regression forests were used to predict relative humidity profiles at the CALIPSO and CloudSat scales. These predictions are able to reproduce a relative humidity variability consistent with the cloud profiles and are confirmed by values of coefficients of determination greater than 0.7, relative to observed relative humidity, and Continuous Rank Probability Skill Score between 0 and 1, relative to climatology. Lidar measurements from the NARVAL 1&2 campaigns and radiosondes from the EUREC4A campaigns were also used to compare Relative Humidity profiles at the SAPHIR scale and at the scale of forest regression prediction by quantile regression.